What happens if the load is a capacitor? It turns out, that using the general principles we already know, we can solve this and many other new types of problems.

At $t = 0$, the voltage on the capacitor is zero. This continues until the step arrives at the load at time $T = \frac{8}{u}$. At this point, the capacitor starts to charge. The final voltage at $t = \infty$ will be $V_g$, the generator voltage:

From this, we can easily find $V_0^-$ using boundary conditions. Or, we can solve this analytically:

$$i_L = C \frac{dV_L}{dt} = i^+ + i^- = \frac{1}{Z_0} (V_0^+ - V^-)$$

Solving for $V^-$,

$$V^- = V^+ - Z_0 C \frac{dV^+}{dt}$$

By the voltage boundary conditions,

$$V_L = V^+ + V_1$$

$$= V^+ + V^+ - Z_0 \frac{dV_L}{dt} = 2V^+ - Z_0 C \frac{dV^+}{dt}$$

So the final equation we need to solve is

$$C \frac{dV_L}{dt} + \frac{1}{Z_0} V_L = \frac{2}{Z_0} V^+$$
The form of the solution for $+2T$ is

$$V_L(t) = A + B e^{-m(t-T)}$$

Plugging into the differential equation gives

$$V_L(t) = 2V_L \left[ 1 - e^{-\frac{(t-T)}{2}\omega} \right]$$

So that

$$V_T(t) = V_L - V_T = V_T \left[ 1 - 2e^{-\frac{(t-T)}{2}\omega} \right] \quad (+2T)$$

Using this, we can plot, say, the voltage at the generator end:

At $t = T$, the reflected wave has amplitude $-\frac{V_g}{2}$, since $V_L = 0 = V_T + V_T$, so $V_T = -V_T = -\frac{V_g}{2}$.

This arrives at the generator end at $2T$, so $V(0, T) = 0$ at $t = 2T$.

The amplitude of $V_T$ increases from $-\frac{V_g}{2}$ to $\frac{V_g}{2}$ over time, so the voltage at $t = T$ increases from $0$ to $\frac{V_g}{2}$.

If we turn off the same, $V_T$ goes to zero, so $V_T$ changes to $V_g$, and then decreases: